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THE

Vinum Nutrio-Phosphaticum.

THE

ORTHOZOIC

CHEMICAL ASSOCIATION.

1200 BROADWAY, NEW YORK.

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1879

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PREFACE.

The object of THE ORTHOZOIC CHEMICAL ASSOCIATION *is to prepare such agents for professional use, as a thorough scientific consideration of the practical problems in physiologic therapeutics shall indicate.*

The Vinum Nutrio Phosphaticum is presented to physicians for their judgment of its value as a physiological agent.

The remarks on the subject of Alcohol in the following pages will, we hope, at least awaken a thorough investigation in respect to the use of alcohol in health and disease.

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THE

VINUM NUTRIO-PHOSPHATICUM

IN

RELATION TO HEALTH AND DISEASE.

THE object of these pages is to present to professional and scientific approval the claim of the preparation to which has been given the name of VINUM NUTRIO-PHOSPHATICUM.

The nature of that claim should be stated, at the outset, in simple and unequivocal terms. It is averred, then, on behalf of this preparation, that it constitutes a complete, final, scientific solution of what is universally recognized as the most important of all the practical problems in physiologic therapeutics.

The practical problem and necessity adverted to turn on the discovery of the chemically and physiologically correct method of applying phosphorus as a constructive and remedial agent. And this problem is one of urgency, because of the unanimous recognition by scientific physiologists of the decisive part which phosphorus plays in the maintenance of the normal standard of brain-health and nerve-health.

Deficiency of power in that crucial part of the human organism, the brain and nerve-system, it is now universally acknowledged can be remedied *only* by the exhibition of phosphorus. While this is so, it is a subject of equally general recognition that no phosphorus-bearing preparation at present in use, or known to the pharmacopœia of any nation, is satisfactory for the purpose in question. It is matter of scientific certainty, indeed—

as these pages will fully show—that no phosphoric compound in present use fulfills the conditions pointed out by the chemistry of the human organism, which such a preparation *must* fulfill, if it is to be *depended upon* in the fullest sense of the phrase, for restoring unerringly the deficient phosphorus to the system languishing for want of it, and which can be reinvigorated only by its supply.

The Vinum Nutrio-Phosphaticum is of such composition as to render it necessary, for the purpose of pointing out its specific and paramount merit as a therapeutic agent, to invite the attention of the medical and scientific world in the most pointed manner to a somewhat closer study of that greatest of questions —the "alcohol" problem. In fact, the statements and discussions made and invited in these pages are twofold. They consist, on the one hand, in an attempt to reduce to precision, to lead to final and scientific conclusions, and so to correct practice, in regard to this grave question of the alcohols ;. on the other, in a demonstration of the true relations borne by phosphorus to the organs and functions in the human system.

And the object of the statement and discussion is to deduce the conclusion that the Vinum Nutrio-Phosphaticum represents the exact conclusions of chemical and physiologic science as to the exigencies of the human system ; and answers the precise and exact demand which that system makes, through the voice of science, for a remedial phosphoric agent.

In a later paragraph the precise qualitative composition of the Vinum Nutrio-Phosphaticum will be given. Of the two branches of the discussion, as just stated, the question of the "alcohols" will be first dealt with. The VINUM NUTRIO-PHOSPHATICUM is so termed because—while it is a phosphoric compound of precisely the character required by science, as will be fully expounded in the sequel—examination will at once show that the product of the grape enters into its structure. The preparation is in fact a combination of true *wine* with phosphates. But the Latin rather than the vernacular term has been given to it, because the preparation is a medicament, and not a beverage ; and it is expected and desired that this important fact should be signalized by the careful and invariable use, in referring to it and prescribing it, of the *Latin* first term in its title, Vinum, in order that it may be fully understood that the preparation, though highly palatable,

is one that should be introduced to therapeutic use under the protective guardianship of professional sanction and advice.

The Vinum Nutrio-Phosphaticum is then in part composed of pure grape-juice, containing the specific variety of alcohol due to fermentation of grape. It is known to chemistry as *ethylic* alcohol. And *here* it is of the last importance to point out that the question of the physiologic function of "alcohol" can never be properly treated, no conclusion upon the subject can be arrived at of a sensible or scientific character, while the term *alcohol* is used in an absolute and unqualified way. The battle of temperance is unfortunately fought over this abstract term, *alcohol*, as things now stand, but it is for that reason fought to no purpose.

This is not the place to enter upon the large field of chemical inquiry involved in the whole problem. It is sufficient for the present purpose to point out that this term "alcohol" is now applied with dangerous indiscrimination to a range of products entirely different in operation, because entirely different in quantity of atomic ingredients. The term "was originally applied to the volatile inflammable spirituous liquor which is the characteristic product of the fermentation of sugar" (*Miller*), but "it is now applied to all neutral compounds of carbon, hydrogen and oxygen which react directly upon the acids in such a manner that water is eliminated while ethers are produced" (*Miller.*)* The alcohols are also of various complexities considered with reference to water as a base—monobasic, dibasic, tribasic, polybasic, with one or more atoms of water.

The passages just cited from this great authority are quite sufficient to show that all discussion of the "alcohol" question, conducted upon the plan of speaking of alcohol *simply* and *absolutely* as though there were but one such substance, must be entirely barren of practical result; the fact being that there is no such single, absolute alcohol, but many products of entirely different atomic composition and behavior, all called by the generic name of alcohol, but each qualified by a specifically different name and term.

For the present purpose it is sufficient to point out that the broad generic difference between beneficial and maleficial alcohols is between the varieties known as *ethylic* alcohol and *amylic* alcohol respectively.

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* Elements of Chemistry, Part III., pp. 169, 170, American ed. of 1866.

Attention is particularly directed here to the following table, from which it will be seen that in atomic constitution, specific gravity, relative vapor weight, and boiling point, the alcohols which alone need be considered vary one from the other; and this variance is connected with their entirely different physiological operation on the human system, *as well as with entirely different methods of procuring them.*

The following table contains most of the bodies at present known which belong to the class of substances *homologous with vinic alcohol;* but there can be no doubt that as science progresses the list will be extended, and that ultimately an alcohol will be found corresponding to each term of the series of the volatile acids represented by the general formula $\Theta nH_2n+_2\Theta_2$.

Alcohols.	Formula.	Specific Gravity.		Vapor Rel. Wt H = 1.	Boiling Point.	
	$\Theta nH_2n+_2\Theta_2$	Liquid.	Vapor.		°F.	°C.
1. Wood spirit or methylic alcohol .	$\Theta\ H_4\ \Theta$	0·798	1·12	16	149·9	65·5
2. Spirit of wine, or ethylic alcohol.	$\Theta_2\ H_6\ \Theta$	0·7938	1·6133	23	173	78·3
3. Trytilic, or propylic	$\Theta_3\ H_8\ \Theta$	0·817	2·02	30	206	96·7
4. Tetrylic, or butylic .	$\Theta_4\ H_{10}\Theta$	0·8032	2·589	37	233	111·7
5. Fousel oil, or amylic	$\Theta_5\ H_{12}\Theta$	0·8184	3·147	44	269·6	132·0
6. Hexylic, or caproic .	$\Theta_6\ H_{14}\Theta$	0·833	3·53	51	299·309	148·154
7. Heptylic	$\Theta_7\ H_{16}\Theta$	0·819		58	351	176·7
8. Octylic, or caprylic .	$\Theta_8\ H_{18}\Theta$	0·823	4·5	65	356	180·0
12. Laurylic alcohol . .	$\Theta_{12}H_{26}\Theta$					
16. Ethal, or cetylic. .	$\Theta_{16}H_{34}\Theta$					
27. Cerotin, or cerylic .	$\Theta_{27}H_{56}\Theta$					
30. Melissin, or melissylic	$\Theta_{30}H_{62}\Theta$					

The distinction between beneficial and maleficial alcohol, it has been said, is that between *ethylic* and *amylic* alcohol. Ethylic alcohol is a pure and beneficial stimulus to the human system, and never otherwise than beneficial when taken in moderation—sometimes, indeed, and in some states and ages of the human system, almost indispensable. Amylic alcohol, on the other hand, is a specific poison, never beneficial, always detrimental. While thus utterly different, and even antagonistic, in their operations on the human frame, they are obtained by different processes.

Ethylic alcohol is a product of the ordinary process of FERMENTATION of fruit or grape sugar. And it should be especially observed, as vital to the distinction of products and processes here pointed out and insisted on, that this ethylic alcohol is the result of the fermentation of the expressed juice of such fruit, grape or other. "But when masses of the husk of grape from which the juice has been expressed are thrown aside and allowed to ferment, the saccharine matter which they still retain undergoes decomposition, *and when the fermented liquor furnished by them is submitted to distillation*, a mixture of butylic, tetrylic, AMYLIC, and hexylic alcohol is obtained" (Miller).

This *amylic alcohol* it is which is ordinarily known as fousel oil, a specific poison. "This substance," says Miller, "is a frequent impurity in brandies distilled from fermented potatoes, barley, rye, and the marc of grapes (*i. e. refuse after expression of juice, stalks, etc.*), to which it communicates a peculiar, offensive odor and taste. Since it is considerably less volatile than either alcohol* or water, it accumulates in the last portions of the liquid when *such brandies* are submitted to distillation," that is to say, to further distillations after the first.

In the same way Liebig avers that the formation of fousel oil or amylic alcohol "never occurs in acidulous fermenting liquors which contain tartaric, racemic, or citric acid;" never, therefore, in the merely fermented juices of fruits as distinguished *from distillation of the substances above mentioned.*

It is most necessary that the mind should firmly grasp this distinction between the beneficial alcohol of fermentation and the strictly poison alcohol of distillation. And in this connection it should be remembered that the process of distillation of spirit is, in point of fact, only a few centuries old. It usually escapes recollection that the frightful effects of alcoholic poisoning, which now begin to alarm sociologists and throw a most urgent responsibility on scientific men and on the medical profession primarily, were unknown to the ancient world, which knew fermented liquors only. For it may be affirmed that every form of liquor produced by the usual methods of distillation carries with

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* Here is meant ethylic or true *vinous* alcohol a product of the *fermentation* of grape-juice, as distinguished from *distilled* products.

it the fousel oil poison, amylic alcohol. It is eliminated, no doubt, from very old liquors long kept in wooden casks, until the fousel oil has been parted with by exosmose of itself and endosmose of oxygen. It is this specific poison, from which scarcely any of the alcoholic beverages now in use in the world, wines, spirits, cordials, are free—except the beers—that the frightfully scourging effect of the drink habit, whether in moderate or immoderate drinkers, is directly traceable.

The important point to notice in this connection is, that the wines and cordials of commerce are almost universally adulterated—*fortified* is the euphemism employed about the matter—by distilled spirit, and therefore by the poisonous amylic alcohol. Distilled spirit, as already insisted on, contains it invariably.

The community is never safe, therefore, from this insidious foe, the effect of which, in rendering hopeless all cases of grave accidents, when reparation of tissues is to be set up, is familiar. Wine which, in its pure and unsophisticated state, can never be otherwise than salutary to the normal human system, and indeed is almost indispensable to the system under conditions of special nervous pressure, certain morbid affections, and most markedly in declining years, as things stand is turned into a curse ; because under disguise thereof all wine drinkers imbibe more or less of what is not wine, but the poison product of distilled matters, either of fruits, or potatoes, or the cereals. Nor can there be any return from the dangerous path into which civilization has incautiously strayed in this matter, until legislation, better instructed by science, recognizes this radical and fundamental distinction between the poison alcohols and the beneficial alcohol, making it a penal offense to sell the former for any except scentific and industrial purposes, and freeing the latter from every form of legal and fiscal restraint or disability.

This is not the place to enlarge upon this sociologic aspect of this scientific question. But as this pamphlet addresses itself particularly to medical and scientific, and highly educated men, it has been thought an indispensable duty to indicate where the real stress of this grave social problem lies, and also the only solution of it, so far as legislation is concerned, which has any. color at once of scientific soundness, as well as of practicability

So long as the discussion is conducted in flagrant disregard

of the scientific facts which peremptorily divide the alcohols into poisons on the one hand, and beneficial—never otherwise than beneficial—stimulants on the other, just so long will social reformers adhere to the extremely foolish and impracticable idea of total prohibition in the form either of the private oath or the legislative command; the only effect of which is *not* to put down intoxication, but to add to that blood-poisoning vice, another and a worse mind-poisoning vice, that of hypocrisy in the makers and fraud in the administration of the law, and unhappily in a very large section of the community besides.

Ethylic alcohol, the product of the unqualified and unfortified fermentation of the grape, is absolutely the only form of alcohol that should ever be employed as beverage or medicament, in pure scientific theory. The stress of the necessity laid on medical men, of sometimes employing alcoholic stimulants, is so great that they are obliged to use the best material in the market. Unhappily, the existing adulterated or fortified wines do as much harm as good. But the ethylic alcohol of true wine can do nothing but good. That form of alcohol really does fulfil the medical object aimed at when alcoholic stimulus is indicated. It preserves the tone of tissue by qualifying or retarding destructive metamorphosis. And it has a further and specific effect, to which attention is most particularly directed, for the point is most material to a full understanding of the precise importance and effect of the VINUM NUTRIO-PHOSPHATICUM in its relations to the physiologic position of phosphorus in the organism. This point will be enlarged on a little later; here it will be mentioned only.

The precise effect of alcoholic stimulant, justifiable alcohol—*i. e.*, ethylic, which is now referred to, is that it relieves the tension of the capillaries—those hitherto not sufficiently studied minor vessels whose supremely important function it is to act as negotiators, if such a metaphor may be employed, between the general blood-system and the soft tissues of all those great organs of the system, the brain, lungs, liver, spleen, kidneys.

It is the office of the capillaries to enable these great organs to effect those blood changes that result in the maintenance of their special tissues and the discharge of their own special functions. Such being their function, it is obviously of the highest

consequence that their own condition and function should be sound and rightfully discharged. Late investigation, more particularly set forth in the sequel, has shown that it is mineral, and especially phosphatic constituents of the capillaries, which furnish the real key to the understanding of their function, and points decisively to the conclusion that deficient mineral, and specifically phosphatic, nutrition of the capillaries is at the bottom of the whole range of really allied and wasting diseases, scurvy, leprosy, phthisis, rickets, cancer.

The use of alcohol, blind and unscientific as it has been hitherto, is, at all events, founded upon the true conception, and aims at the important result of relieving the seminor vessels—the capillaries—of their tension, and so enabling them to keep up right relations between what may be called the general blood-mass of the body, and the differentiated blood which is produced by the specific action of the specific organs. Not, indeed, that there has been anything like an adequate appreciation of the fact that each of these organs must differentiate the blood in order to procure and maintain its own specific tissue and function. This very important branch of physiology has hitherto been neglected.

The work of ethylic alcohol in the system, then, and its beneficial effect, are in promoting the right relation of blood to specific organs, and this specifically through the capillaries. The salient reason why wine is beneficial to aged persons in particular, who are so very susceptible to cold, is that the cutaneous capillaries, from deficient blood-circulating power, are not in a condition to act as good blood-channels.

Alcohol—always understanding thereby the ethylic variety of true wine—dilates the capillaries and diminishes their tension, thus enabling all the organs so entirely dependent upon their efficacy to maintain themselves in function and structure.

Generally speaking, in all adynamic conditions of the system, from infancy to old age, alcoholic stimulation of the rightful order is indicated, and no other remedy will be found to act so beneficially; for no other has so direct an effect of retarding the tendency of blood congestion which is the distinguishing feature of the adynamic condition of the body.

Unfortunately, however, the wines of commerce almost uni-

versally contain fousel oil, because containing amylic alcohol mixed with them; and this poison alcohol, the invariable concomitant of distilled spirits, counteracts, by its subsequent and specific nerve-depressing effect, all the benefit which it may for the moment produce in relieving capillary tension, leaving a net balance of decided mischief to the organism invariably on every occasion of its use—a balance which, as all know, so frequently accumulates until the system is saturated with alcoholic poison of the amylic kind, with disastrous effects, either of acute disorder to brain and nerve function, or the promotion of disease in some one of the chief bodily organs; with accompanying tendency to fatty degeneration, due to the ingestion of excess of hydro-carbonacious material (alcohol) in that shape of amylic alcohol which is specific poison.

In view of this reasoning, it is high time that the profession first, and afterwards the public, should strive to reach some scientific ground in this matter. The stimulus of the poison alcohol of fortified wine as usually sold, and of distilled liquors, is of use as things stand, no doubt, in cases of grave emergency, where sudden failure of heart-power must be dealt with by such means as are available. But, in view of the grave consequences that attend the use of the poison-alcohol, and of the fact that ethylic alcohol produces the beneficial effects desired without qualification or ill consequence in all cases—whether of sudden, urgent need, or where gentle and continuous nerve and capillary stimulation are desired—a systematic effort should be made to discard the poison alcohol altogether, and establish the exclusive use of fermented and ethylic alcohol, both for medical and general purposes.

In fact, it may be said that the safety of society depends in great part upon a systematic crusade against distilled amylic alcohol, and the restoration of the average human system to that high average which existed before its introduction into the world. If this were done, and if also there were introduced into general use, under proper medical advisement and safeguard, such a preparation of phosphorus as meets the precise chemical requirements of the system in respect of that element, the most material of all the brain tissue, nerve tissue, and *capillary tissue*, it is highly probable that the scrofulous and syphilitic poison circu-

lating through the veins of so large a portion of civilized humanity, and exhibiting itself in various forms of morbid *diathesis* ranging from consumption to cancer, might eventually be wholly eliminated.

The characteristic difference between ethylic and amylic alcohols should be observed. Ethylic alcohol is of etherial quality, and accordingly is a pure, non-irritant, diffusible stimulant. Amylic alcohol is the product of the distillation of compounds generated by the fermentation of amylaceous (starchy) substances. It is likewise generated when poor, cheap astringent wines are subjected to distillation, and abundantly generated when such wines are distilled in connection with the fermented marc of the grape, *i. e.*, the masses of grape-husks from which the juice has been expressed. Inferior brandy, therefore, always contains a large quantity of fousel oil; but all distilled liquor contains it more or less. This amylic alcohol is a heavy, oily product, of a burning, irritating, and poisonous property, and quickly affects the blood. It vaporizes rapidly, and its poisonous vapor affects the brain, and through the brain the nerve-system. Distilled liquor is added to the wines of commerce in order to prevent subsequent acetic fermentation.

Evidently, therefore, chemistry is challenged to discover some method by which pure wine, with its beneficial ethylic alcohol, may be preserved and transported without suffering that acetic degeneration, to obviate which nearly all the wine of commerce has been, in the latest centuries, qualified by admixture which ruins it so often in a gastronomic, and, *invariably*, in a sanitary point of view. It follows that those wine-makers, of whom we are thankful to know there are a few, who are striving to introduce into consumption genuine and quite unfortified wine, free from amylic alcohol, should be signalized for special patronage by the medical faculty and the public at large.

In the meantime, lives will be continued to be saved by the use, in emergency, of such wine and spirits as are at hand; while some will be lost because of the justifiable though unscientific alarm so widely spread by the poisonous action of the familiar wines and all the distilled spirits of commerce—an alarm which prevents its use even when most urgently required. The popular alarm is justifiable; but the physician is not justifiable who

does not clear up his mind and knowledge upon this very grave matter. For if, on the one hand, amylic alcohol is so far a poison that it should be discarded altogether, nothing is more certain than the fact that medical practice in a large range of cases requires the use of the beneficial ethylic alcohol; and medical practice herein goes with a general exigency and a nearly universal need of mankind. The idea that wine can be expelled from human use is outrageously impracticable.* The real calamity of the situation consists in the fact that a spurious product, falsely called by the name of wine, is now nearly universally consumed, with disastrous consequences. The one thing now needful is to re-establish the use of wine, properly so called, and expel from use the deleterious stuff that now goes under its name.

It has been pointed out that the beneficial effect of alcohol is to relieve the tension of the capillaries, and so by a gentle stimulus to place them in the most favorable condition for the discharge of their supremely important function in the organism. How important this function is, it is indispensable for a right understanding of the physiologic *rationale* of the Vinum Nutrio-Phosphaticum that the mind should thoroughly grasp. All tissue, let it be remembered, is the result of transformed and fixed blood; of blood which, under the specific power of the organism, is changed from a liquid to a solid or qusi-solid condition.

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* It should be noted, in this connection, that nearly all the religions of the world have incorporated it into their ritual in some of their most solemn and impressive parts. Nor is it irreverent to refer to the place which wine holds in the most affecting of all the religious acts of the Christian Church. In view of the action of the ethylic alcohol of true wine on the human system, of its promotion of physical cheerfulness, and therefore, indirectly, of such a predisposition of the body, pointedly described in Scripture as the temple of the Holy Spirit, as fits the mind to receptivity of higher influence, the sacramental office of wine becomes intelligible. This mode of regarding the matter will be slighted or suspected only by those foolish persons who forget that all and every part of the being of man should be pressed into the service of his Maker, and who fall into the grave error of supposing that the human spirit can serve Him acceptably when allied with a scorned and neglected, and therefore sickly bodily system. Religion and science may be opposed elsewhere, but here they are wholly as one in protesting against delusions so dangerous, compounded equally of impiety and silliness.

The great organs of the body—brain, lungs, liver, spleen, kidneys—are respectively products of the blood, differented by that subtle constructive power of the total organism, so as to produce those various and different metamorphic results from a single liquid and plastic material. And all these great organs are never for one moment in a state of stable equilibrium. There is no one moment of statical rest in any organism whatever. Every molecule is in a constant state of flux ; the waste and the replacement of tissue are processes always going on. Now it is the capillaries, the arterioles, which have laid upon them the direct responsibility for the correct discharge of that most critica duty of the organism—that of maintaining soundness in structure and formation of all those great leading bodily organs. If there be any defect in the capillaries themselves, it is not possible that the subtle changes which the blood must undergo in the interest of the various organs can possibly be effected with regularity. It is certain, therefore, that such capillary defects must lead to functional disorder in some one of the organs referred to, and eventually, of course, to organic disease, unless remedy is applied. Such being the weighty office of the capillaries, it is not a little surprising that chemical physiology has, till quite recently, neglected the study of their precise composition. Fortunately, however, a chain of events has lately occurred in connection with this matter, which fills up this serious gap in physiologic study, in therapeutic as well as constructive medicine. One of these events is the introduction of the Vinum Nutrio-Phosphaticum into medicinal use. And, fitting in with this event, coming at the precise moment when the Vinum Nutrio-Phosphaticum had virtually solved the important problems of phosphoric medicine, there occurred an almost simultaneous investigation in England, on the part of a distinguished medical man and chemist, which throws the required and decisive light upon the whole question of the capillaries ; promises to revolutionize the treatment of all the diseases of brain, nerve, and soft tissue structure ; all wasting diseases, phthisis, scurvy, rickets, leprosy, etc.; and incidentally establishes the Vinum Nutrio-Phosphaticum as the precise compound required to combat pathologic conditions of brain, nerve-system, and, generally, of organic structure.

The key to this most important approaching revolution in

apprehending and treating all these classes of diseases is to be found in the close and accurate study of the relation *between the alkaline bases and phosphoric acid*, and the precise mode in which these combine to enter into capillary and other structure. Of the four combinations of phosphorus with oxygen, phosphoric acid (PO_5) is the only one found in the human organism, and it is an essential part of all animal and vegetable life. Phosphoric acid, it should be observed, is the most highly oxidized form of phosphorus.*

The question of questions, then, in connection with the administration of phosphorus, is plainly the following: What is the precise combination of phosphoric acid with the various alkaline bases known to the organism, lime, magnesia, soda, potash, in which this critical acid is found in the brain, the nerve-tissues, the capillaries, and other immediately connected parts of the organism?

As to the osseous portion of the frame, the phosphatic element therein is so easy of ascertainment that no question can be made. Phosphate of lime enters too largely and unmistakably therein for any misapprehension. But, for the clearing up of the more important question of the relation of phosphorus to other organs of the body, it is necessary to draw attention to the way in which phosphoric acid behaves with bases; for this behavior is the key to the matter. Phosphoric acid combines with water and bases in certain fixed multiple proportions. There are three definite hydrates of phosphoric acid, and three definite salts:

1. Monobasic salts: one equivalent of base to one of acid.
2. Dibasic salts: two equivalents of base to one of acid.
3. Tribasic salts: three equivalents of base to one of acid.

Rigid investigation shows that all the phosphates in the tissues belong to this last order, the tribasic; nervous tissues containing, in addition, phosphoric acid as a hydrate or in combination with organic matter.

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* The series is:

Suboxide	P_2O.
Oxide (hypophosphorous acid)	PO.
Phosphorous acid	PO_3.
Phosphoric acid	PO_5.

The investigation which conclusively proves this most important point is set forth in the remarkable volume of Dr. Anderson, entitled the *Phosphates in Nutrition*,* a volume which must necessarily involve an entirely new departure in the theory and treatment of brain disorder, nerve disorder, and all the diseases of tissue-waste.

First. It should be noticed that, in Dr. Anderson's words, "The tribasic series of phosphates possesses the exceptional peculiarity that the combination between the base and the acid need not be confined to one particular base; but, by an interchange of bases, a series of salts can be produced in almost endless variety. The three equivalents of base may be built up of two, three, or more different bases, but always containing three equivalents of basic matter to one of acid. In illustration, starting with tricalcic phosphate ($3CaOPO_5$) as typical of this class of salt, there may be substituted, for two equivalents of lime, one each of magnesia and soda, so as to obtain a salt with the formula ($CaOMgONaOPO_5$). There are here three equivalents of base to one of acid, just as in the tricalcic compound; but in one case all the equivalents consist of lime, in the other they are made up of one each of lime, magnesia, and soda. Each of these separate bases may be again divided and represented by an equivalent portion of some other base."†

The peculiarity of these tribasic phosphates here described is one which well deserves thoughtful attention on the part of all physiologists, and suggests the explanation of the fact, which Dr. Anderson thoroughly establishes, that, as already stated, it is precisely in the shape of these tribasic salts of phosphate that phosphorus appears in the tissues, entering with the utmost distinctness into the tissue of the inner membrane of the arteries *and into the tissue of the capillaries;* all vascular tissues and organs, such as the skin, liver, kidney, etc., showing the existence of this salt in considerable quantities, while the less vascular, such as tendon and hair, show only traces. The extreme and special flexibility to interchangeableness of base, as between the four alkalies, is precisely such a characteristic as we might *a priori*

* London: Baillière, Tindall & Cox. Strand, 1878.

† Anderson, p. 25.

expect to attach to that salt of so protean an element as phosphorus which should be found to enter into tissue-formation. Beyond all doubt the precise effect operated by phosphoric acid in the maintenance of organic function and structure is produced by a swift transition and flux of construction of these endlessly variable permutations and combinations of the four bases with the phosphoric acid, to form tribasic salts, accompanied by subtle changes in the phosphorus itself, analogous to, but far more complex than, that we know of in the element, its capacity for taking *allotropic* conditions, as they are called, in which its behavior is quite various and even contradictory.

It is established, then, that these tribasic salts—to which the name *tissue phosphate* has been given, enter largely into the composition of the capillaries; established by rigorous and carefully conducted chemical analysis. And it is an inevitable conclusion that "the presence of tribasic phosphate in all the organs of the body is dependent on its entering into capillary formation. In nervous matter, besides this, it takes part in tissue-formation, or rather phosphoric acid does, probably as a component ingredient of cerebral matter." * In the larger arteries, too, there is "the fact of the inner membrane showing a much larger proportion (*i. e., of tissue phosphate*) than the middle and outer membranes. It is the inner coat which is the foundation and commence men of the finer arteries, and subsequently of the capillaries." †

"In all cases, whether it be brain, lung, liver, or any other highly vascular organ, there is about the same quantity of base available for triple phosphate formation; in the less vascular tissues the quantity is smaller." "The inorganic constituents of brain and nerve present features distinct to those apparent in the other soft tissues, for although they all contain the same inorganic materials—lime, magnesia, potash, soda, chlorine and phosphoric acid—there is a large excess of phosphoric acid in the brain of both omnivora and carnivora." ‡ And it is proved by autopsy that brain-softening is distinctly due to deficiency of phosphoric acid; a fact of the utmost consequence.

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* Anderson, p. 40, rather *certainly;* for there can be no doubt of the existence of phosphoric acid in cerebral matter: analysis plainly reveals it.

† Anderson, p. 40. ‡ Id., pp. 42, 43.

Upon the basis of a clear and unequivocal establishment of the existence of these tribasic phosphates in the soft tissues, *most notably of all in the capillaries*, and of excess of phosphoric acid in the brain and nerve-tissue—of which establishment the chemical proof is absolute and irrefragable—the most momentous consequences are clearly deducible in regard to the whole category of the diseases which depend upon *nutrition*. And the word *nutrition* is here used, be it observed, in the large physiological sense germane to the subject. In that sense it signifies such an administration and assimilation of *food* in normal bodily condition, or *medicament* in abnormal, as *keeps up the equilibrium between formation and waste of tissue*. The satisfaction of hunger is, physiologically, only a means to that end. Of the *ingesta* of food, part is excreted, the residue goes to the establishment of the equilibrium in question, supplementing those needs of tissue that arise from its waste under continuous oxidation. Every organ in the body has to be fed; deficiency of the food of any necessarily throws the total organism out of gear. The office of nitrogenous food in maintaining tissue, of hydro-carbonaceous in directly supporting combustion or oxidation, has long been recognized.

But what has now to be recognized is, that the offices of these two great classes of food depend for their effective discharge upon the presence in the tissues, *in the capillaries most notably*, of an adequate quantity of that *tribasic phosphate*—tissue phosphate, heretofore so-called. Unless that *tissue phosphate* is there adequately present, a morbid condition of the tissues sets in, in which they undergo alteration more or less grave, issuing eventually, according to the disposition of the subject, in some one of the pathologically allied diseases of *scurvy*, *rickets*, *scrofula*, *consumption*, *cancer*, or *leprosy*; while the same deficiency of tissue phosphate exhibits itself in other subjects, by reason of the accompanying defect of *phosphoric acid*, in the various protean forms of brain disorder and nervous *asthenia* with which multitudes of suffering creatures are scourged.

The considerations so far advanced are such as to indicate very clearly the chemical conditions of such a compound of

phosphorus as should justify its claim to be the precise combination for which medical science has been so long in search; while, at the same time, the foregoing argument disposes conclusively on scientific grounds, medical experience having already brought them into suspicion, of the claims of the various phosphoric compounds in actual use. The latter point is one that may profitably be dwelt on for a moment. Free phosphorus is nowhere found in the human system. Any preparation, therefore, which contains it stands condemned *ipso facto*. Indeed, the answer to the question propounded in this paragraph involves the condemnation of every form of phosphoric combination except such as are actually found in that organism itself. No *hypophosphite* is there found. Phosphoric acid is found there, as it is in fact, in nearly all the ordinary foods of man. But it by no means follows that the administration, *medically*, of phosphoric acid *per se* is therapeutically wise or safe, because phosphoric acid is found in foods, and enters into brain and nerve-tissues, over and above and supplementally to the *tissue phosphate* (tribasic), found both in those tissues as well as in the capillaries, arteries, and elsewhere. The whole subject is now governed by the capital and decisive facts lately established of the existence of these *tissue phosphates* in that part of the structure of blood-circulators immediately concerned in the maintenance of the organization and function of the great leading bodily organs—the capillaries and the arterial structure in which these take their rise. It follows from this last achievement of physiologic chemistry, incomparably the most weighty of all, that phosphorus is not merely a *stimulant* to the performance of bodily function, in which light it may be said to have been hitherto regarded. It is an essential element of *structure* in the most critical part of the organism; and its effect upon the bodily health—whether that effect is to be regarded as of stimulus or support is immaterial—depends wholly upon the fact that it is a component of structure. But, inasmuch as nothing can enter into structure which has not previously become plastic to all intents and purposes in the blood, and nothing can become strictly plastic in the blood which is not to be correlated to structure, it follows clearly that the precise and only phosphoric combination which can properly supply that

element is that of the *tribasic* phosphates in solution; and that the solution should be of such collateral ingredients as to afford the nearest approach to certainty of a genuine assimilation by the organs. This is only to say that natural conditions must be the guiding ones in the matter now that these are understood. The administration of simple phosphoric acid, of hypophosphites, etc., precarious and doubtful as medical experience has shown them to be, has been excusable in the absence of the clear scientific light which has shown that phosphorus in specific combination is an essential element of nutrition to the most critical of the bodily tissues. But now that this light has come, there can be no excuse for the use, in therapeutic or constructive medicine, of any except the *tribasic phosphate.*

The following passage from Dr. Anderson's book is very material here:* "On the ground of only partial supply of necessary material can be explained the limited success of the treatment of diseases of nutrition by the means hitherto employed. There has been a growing feeling among chemists and medical men, that phosphorus or some of its compounds in some way minister and are necessary to the healthy maintenance of human life. Phosphorus, and some of its compounds, have been for some time used in medicine; *but there is no preparation, either in the British Pharmacopœia, or amongst the medicines in general use, which is capable, without the addition of some other ingredient, of forming a tribasic phosphate such as that found in the tissues.*"

The preparation that should claim to supply this void, then, must plainly fulfill the following conditions:

1. It must contain *all* the phosphates known to the human organism and in *tribasic* form.

2. It must contain the most appropriate and effective of all the healthful stimulants known to capillary action; or, in other words, capillary tissue (being that into which the *tribasic phosphate* has to be thrown, as being that which is certainly deficient in that salt in the whole range of organic or functional disorder when phosphorus is indicated) must receive in the preparation that sort of stimulus, together with the circulating

* Anderson p. 173

system generally, which puts the capillaries in the highest degree of susceptibility for assimilation of the *phosphatic tissue* tendered to them.

3. It must contain, over and above these first ingredients, other chemical agents which chemistry generally, and especially the chemical physiology of the maternal function, show to have a special power as solvents of the alkalies of the system, and in promoting that obscure, but decisive work of the organism in which these alkalies blend with phosphorus for the highest purposes of construction known to the human body, *that of producing new human organisms in their entirety*—a function which must necessarily be the key to the right method of repairing defect, organic or functional, in organisms already existing.

A statement of the qualitative composition of the VINUM NUTRIO-PHOSPHATICUM will show that it answers all the conditions which science exacts in the subject-matter.

QUALITATIVE COMPOSITION OF THE VINUM NUTRIO-PHOSPHATICUM.

Volatile essential oils and ethers ;
Phosphate of calcium, tribasic ;
" " potassium, "
" " magnesium, "
" " sodium, "
Tartrate of calcium ;
Bitartrate of potassium ;
Ethylic alcohol ;
Nitrogenous matter ;
Grape-sugar ;
Malic acid ;
Lactic acid ;
Traces of iron ;
Water.

The VINUM NUTRIO-PHOSPHATICUM is the only known perfectly durable solution of the whole range of the nutritive phosphates with plastic matter ; capable, therefore, of dialysis through the membranes of the *primæ viæ*, and therefore of ab-

sorption into the blood. It will keep well without any form of decomposition or degeneracy in any temperate climate. After the exposition of the alcohol question, given at the outset of these remarks, it can scarcely be necessary, though it may be expedient, to say, in connection with the affirmation of the indestructibility of the compound, that it is wholly free from suggestion of amylic or distilled alcohol, the poisonous fousel oil. This indestructibility is the result of the specific chemical action whereby the phosphates of the Vinum Nutrio-Phosphaticum are made to enter into it in perfect non-acid solution.

Acidity of the system, it should be observed, is antagonistic to the solution of the phosphorus of food or any other administered phosphorus. This point, therefore, of the non-acidity of the Vinum Nutrio-Phosphaticum, except in regard to a certain desirable acid reaction due to the lactic acid present, is of great importance. The Vinum is the only preparation hitherto introduced into the pharmacopœia which contains the whole range of the phosphates in tribasic form; but of all these perhaps the phosphate of calcium, in reference to this point, deserves the most attention, as it is the first successful attempt to procure in non-acid solution this indispensable phosphate, which enters so largely into bone-structure. The consideration rightfully due to this weighty fact furnishes the pivot on which an adequate exposition of the immense range of benefit derivable from the general use of the Vinum Nutrio-Phosphaticum may properly and logically turn.

A few explanatory words are necessary here before going into the descriptive enumeration or classification of this widely beneficial range, which will be seen to have two great leading divisions. The VINUM is confidently propounded, on the one hand, as the precise and specific remedy indicated (1) in all functional and organic diseases of the brain and nerve-system, and (2), in all the allied diseases *now clearly traceable to deficiency of tissue phosphate in the capillaries;* consumption, scrofula, cancer, scurvy, leprosy, rickets. On the other hand, the precise reasons which peremptorily dictate the administration of the VINUM in this whole wide field of disease point to a conclusion which makes the preparation even more valuable to the human race. For its use, under proper circumstances and in suitable quantity,

will hereafter have more significance in a PROPHYLACTIC than in a THERAPEUTIC point of view. The chemical and physiologic doctrine on which the VINUM stands suggests, with the irresistible force of almost mathematical demonstration, that the VINUM, rightfully used under skilled advice, is capable of attacking the ultimate source and spring, the very *fons et origo*, of all the diseases of mineral innutrition above mentioned, and of eventually expelling the generic morbid diathesis, of which each of the diseases is but a *specific* development, from the veins of the human race.

Brief as are the limits within which this writing is to be confined, it is hoped that enough will be said to lay a firm foundation in all thoughtful minds for these wide reaching and momentous conclusions. With reference, then, to the tribasic phosphate of calcium contained in the VINUM, in company with tribasic phosphates of the three other critical bases, it is desired that attention should be given to the following considerations:

Bone constitutes a large proportion of the human frame. In the human adult it is made up of from 60 to 70 per cent. of mineral matter and from 30 to 40 per cent. organic matter. "The organic matter consists of a nitrogenous compound which yields gelatine on prolonged boiling, and the inorganic matter consists mainly of tricalcic phosphate, a material containing three equivalents of lime to one of phosphoric acid, and in which phosphoric acids exists in the proportion of 45.81 per cent."* Gelatine, let it be remembered, is the intermediate stage of oxidation between protein or albumen, the specific nutriment of flesh-tissue, and urea, the chemical shape in which ingested nitrogen that has not gone to form tissue is ejected from the system; the three oxidized substances being respectively protein, albumen, urea. Gelatine, therefore, enters in those tissues which represent the permanent mechanical structure of the organism rather than its dynamic and ceaseless fluctuation. The very large proportion of phosphoric acid entering into bone composition should be especially observed.

Now it should be remembered that, hitherto, physiologic doctrine has failed to state any satisfactory links of mutual action

* Anderson, p. 22.

or influence between the soft tissues and the bony structure of organisms, human and other; and this gap in physiology has a decisive bearing on the correlated defects of therapeutic and prophylactic, and, still more, *constructive* medicine. That the organism acts as a *whole* is the axiom which underlies all physiology. It follows from this that, *in some way*, the soft tissues, through all their varied development of organic detail, must be correlated to and affected by the harder and bony tissues.†

And, while this is obviously true for *adult* life, its truth is more impressive and *more practically important* in the case of *growing* life. The fixation of the bony structure in the adult, and the comparatively slight changes that occur therein *until old age*, may well have blinded observation in understanding the connection between the hardest and softest bodily tissues during maturity. But the phenomena attending those periods when the organism is under *construction*, from embryo to maturity, and when it is under the *destructive* influence of age, challenge the scientific mind to serious endeavors for philosophical and practical conclusions upon this weighty subject of the mutual influence between hard and soft, mechanical and dynamic elements, organs, and parts, of human and other systems.

The very large proportion of phosphoric acid contained in bone structure—entering into its tricalcic phosphate, and constituting in fact *about one-half of the mineral matter of bone*—is a fact now, plainly, of infinitely greater weight than has heretofore been felt in regard to the grave problems of practical and medical physiology with which we are dealing. We now have conclusive proof of the existence of the tribasic phosphates in the capillaries, and of the dependence of the working power of these —on which the whole system depends for its tissue-nutrition, *and therefore for its health*—upon an adequate presence of that tissue phosphate. We see, again, that during the period of growth an immense constructive work has to be done in the growing system in connection with phosphoric acid, of which so large a portion has to be combined with calcic oxide to form the specific bone phosphate.

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† The peculiarity of nail-structure in so large a proportion of pulmonary consumptives may here be usefully recollected.

At the advanced periods of life, on the other hand, we see a precise measure of bodily failure in the disintegration precisely of this tricalcic phosphate of the bony system, and a corresponding brittleness thereof. At both these periods, then, when the organism exhibits in the strongest light the phenomena of nutrition, first at its *maximum*, and last at its *minimum*, of constructive power, we see decisive indications that the key to its action is to be found in its effectiveness and energy to combine phosphoric acid; and that effectiveness, that energy, is to be viewed as a unit of power, though diversified in operation, diverse in locality and organ. It is the one organized laboratory of the body, which at the same time forms or fails to form the *total* phosphatic parts of the system. For bony structure, fixed and of less variability tricalcic phosphate is formed; for the capillaries and other soft parts, where phosphates enter, the more flexible power of the tribasic phosphate to make permutations and combinations as between the four bases and thirds thereof, previously adverted to, is invoked. But this wonderful and affecting diversity of operation and construction depends upon the single principle of the unified power of the organism. And that power depends upon the presentation by the blood general to the blood constructive, that is to say, by the venous and arterial to the capillary system, of tribasic phosphates, depends therefore upon the ingestion into the system of such phosphates in non-acid solutions; and with such accompaniments as stimulate and measurably guarantee their assimilation.

Firmly grasping the guiding clue here indicated, which points to the tribasic phosphates as the specifically constructing potency in the organism, and viewing disease, whether of function or of organ, through the light thus cast upon pathological conditions; viewing these as related to deficiency of nutrition, of constructive potency—necessarily, therefore, of tissue or tribasic phosphate—we are in a position to consider them separately, and how the doctrine bears upon remedy and reconstruction.

The group of diseases which have been indicated above, depend upon transmitted tendency, constitutional predisposition, and special strain supervening, which determine the development of one or the other in a given subject. The disease *rickets* is a convenient starting-point for the discussion in detail of the ques-

tions involved. This is obviously so, because here we detect in the utmost flagrancy the deficiency of mineral and phosphatic construction. The administration of the Vinum Nutrio-Phosphaticum is here of specific efficacy, dealing, as it does, directly with the difficulty of the formation of the bone, or tricalcic phosphate, and also with the general range of phosphatic nutrition, because it contains all the phosphates in tribasic form. And it may be repeated here that no preparation except the Vinum is of tribasic phosphate generally, and that, until the Vinum was compounded, there has been no attempt to present in solution phosphate of lime, the great ingredient of bone tissue.

But it is in connection with cancer that the doctrine which has been suggested, of the intimate relation between constructive and remedial medicine, and which it will be the office of the Vinum Nutrio-Phosphaticum to establish in theory and practice, may be most profitably considered. All the diseases with which we are dealing are *primarily* transmitted in hereditary blood tendency. If their cause in the system itself is to be found in deficiency of phosphatic nutrition, in a want of balance between the various tribasic phosphates of bone and soft tissue, and, speaking generally, in departure of phosphoric action in the organism from a hypothetic normal standard of operation, then these considerations, taken together, point to the maternal system as the most important. Diseased tendency is transmitted, no doubt, through both parents. But it is the mother upon whose organism the work of construction is really cast. It is, therefore, in the study and treatment of her organism that this grave and momentous problem of the *present treatment* of transmitted diseases and their *eventual extirpation* must find, if anywhere, its solution; especially now that we are enabled to see, in this new light of the phosphates of tissue, that the problem is strictly one and the same; that the cure of actual disease induced by abnormal phosphatic conditions must point the way to their eventual extirpation, or at least to a minimizing of their occurrence.

Cancer is precisely that disease which helps us best to understand this matter in all its bearings. During gestation, and afterwards in lactation, a special and most serious strain is laid upon the female system in reference to constructive power: theoretically, therefore, upon phosphatic power; actually upon that speci-

fic vein of potency, as chemistry shows. It is convenient here to quote the words of Anderson (p. 184), that bear upon the chemical side of the subject: "In milk the phosphates exist in considerable quantity, and must be derived from the food; under the stimulus of lactation the greater part of the phosphates which exist in the food enter into milk composition, and the inorganic requirements of the maternal tissues are not attended to. The capillaries are under-fed with inorganic matter, and cancer, as the result of special innutrition, supervenes."

The last assertion in this weighty passage is put at once too narrowly and too largely. The proper way to put the matter—and which expresses the author's own drift—is to say that when cancer does supervene it is due to the defective nutrition of the maternal tissues. But cancer is only one of the disorders that may supervene in consequence of such defect of tissue-phosphatic nutrition. Pulmonary phthisis, or any other disease which depends upon such innutrition, may, according to the diathesis of the subject, eventually declare itself. The distinction, however, is immaterial, comparatively; the important point is to determine whether we really have a guiding clue of diagnosis and treatment which leads us through the complex labyrinth of these multiform but cognate maladies.

The passage quoted from Dr. Anderson's book does, however, furnish an excellent text and foundation for the right method of dealing with the relation between the maternal structure and the hereditary diseases dependent upon transmitted tendency and structure. Lactation is a function whose influence on the system is not to be measured by its isolated and temporal exercise. It can only be estimated aright, and the whole question now under consideration be appreciated in all its length and breadth, by remembering that the system of woman is in its normal functions attuned—if the expression may be used—to the sacred and august function of maternity.

It is not necessary to signalize or dwell upon all the facts which show that in the female system there is a constant strain of preparation and resolution of substance and tissue, all pointing to the one great culminating office of her physical nature, such as is not known to man's system. Gestation and lactation are but the extreme manifestations of a disturbance always

present, more or less, in woman's frame. We may indeed generalize the observation of the writer quoted, and say with truth that the maternal tissues—the tissues of woman, generally—are not attended to by nature, in this measured sense at all events, that they are sacrificed* to the maternal office.

But it is the business of theology and science alike to struggle against the natural, and produce the regenerate, being. And the light of science in this special matter is now decisive. Transmitted disease of innutrition—phthisis, cancer, rickets, scurvy, scrofula, leprosy—all depend upon the fact, understood in the proper and *general* way just explained, that, under the stimulus of the reproductive function in woman, and chiefly, *quam maximé*, of course, when actually exercised in gestation and lactation, "the greater part of the phosphates which exist in the food enters into milk composition and the inorganic requirements of the maternal tissues are not attended to. The capillaries are underfed with organic matter."

The common development of cancer in the uterus and mammæ, at a period when "their vitality has been lessened by cessation of their functions," is only a high point of illustration of the general disturbances and loss of balance in specific phosphatic nutrition which characterize the female system. "Women after a certain period of time are more liable to cancer of the uterus or mammæ than younger women. In these cases organs endowed with high vascularity, latent or active, as life advances, lose the vitality endowed by activity, and in cases which affect general nutrition being in a weak, feeble state, from inactivity, are the first to suffer.† Nothing could more decisively bring home to the mind the conclusion that it is the strain on the system due to the reproductive function, which produces in woman the specific form of the general disease of phosphatic deficiency called cancer, than the fact that it does so commonly declare itself in the two allied organs, mammary and uterine.

The theory which attributes to this strain on the female sys-

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* Let it be remembered here, for our peace of mind, that this word is after all, only a better and more emphatic form of the thought and word "consecrated."

† Anderson, p. 135.

tem, first, the breakdown of so many women in some one of the allied group of organic diseases indicated, and, secondly, the transmission of these diseases potentially in the blood of descendants, is of irresistible force in connection with the scientific facts concerning phosphatic nutriment in the capillaries. In view of the experience already acquired as to the effect of the Vinum Nutrio-Phosphaticum upon a large number of cases where organic lesion had supervened upon functional disorder, and there was urgent necessity for supply of healthy new tissue, it is confidently believed that its tribasic or tissue phosphates, administered systematically during gestation and lactation, must supply this now plainly recognizable need of *phosphatic support* to the overtaxed female system; and, accordingly, at once rescue myriads of female lives and enable them to transmit to posterity blood free from that disease tendency which inheres precisely because of the strain on the system of the female parent.

These propositions are submitted in the most earnest spir it to all thoughtful medical men, and to all reflective minds. They indicate benefits of so extraordinary a character, so far-reaching yet so immediate, as all but certain to flow from the use of the Vinum Nutrio-Phosphaticum in this class of cases, in the therapeutic and prophylactic support of all women in gestation and lactation, as to challenge with no ordinary force the sense of responsibility, in which happily for the world, the medical profession has never been found deficient.

But, however this may be as regards the general adoption of the Vinum Nutrio-Phosphaticum as a constant phosphatic force supplementing that phosphatic deficiency which the argument shows to be inevitable in gestation and lactation, nothing is more certain than that the VINUM is positively indicated in all cases where there are signs of that order of disease in mother or child now clearly traceable to such phosphatic deficiency, or known to be so without power to cope therewith. RICKETS, for example, may be attacked with absolute success by the Vinum Nutrio-Phosphaticum. And, indeed, so vehement is the probability, from the philosophy and chemistry of the subject, that *all* the protean forms of feminine and infant disorder, which arise while the infant, born or unborn, still derives its tissue from its mother, depend more or less upon phosphate deficiency and dis-

turbance, that now that there is a preparation which positively tenders to the system the very tribasic or tissue phosphate actually there, it would be grave error in all these cases to omit the exhibition of so almost certain a remedial agent.

Experience, now extending over three years, has amply proved the extraordinary benefit conferred by the Vinum Nutrio-Phosphaticum in a large number of cases where organic disease had set in or terrible mechanical lesions had occurred. In cases of *phthisis*, of *brain disorder*, *even indicating lesion of structure*, of all forms of breakdown of the nervous system, nervous *asthenia*, the Vinum Nutrio-Phosphaticum has been employed with an effect nothing less than decisive. The conformity between the physiologic and chemical theory on which the VINUM is based, and on which it has been compounded, and actual therapeutic practice has been so absolute that the strongest language would be justifiable in pressing upon the profession, *as a question of urgency*, the adoption of this preparation in the whole wide range of cases of functional and organic disorder to which reference has been made.

A passage from Dr. Anderson's book, so often drawn upon for the purpose of this writing, is much in point here: "In the lectures on muscular arterioles, delivered by Dr. George Johnson, attention has been drawn to the general hypertrophy of the muscular walls of the small arterioles in certain forms of disease, especially that form of Bright's disease associated with granular degeneration of the kidneys. This hypertrophy, according to the views here advocated, depends upon or is connected with deficiency of organic matter* in the arterioles or capillaries. Organic diseases have their origin in some disturbance of the laws of nutrition: either there is deficiency of some one alimentary principle in the *ingesta*, or nerve influence, which controls their conversion into tissue, is at fault. Chemical examination of the different articles of food which compose the dietary of a man shows that in the ordinary dietary of man the inorganic portion is that which is most likely to be deficient, or to exist in a form not easily digested or assimilated. In all diseases of nutrition we should therefore expect diseases

* *I. e.*. tissue phosphate or tribasic phosphate.

which, on chemical grounds, can be shown to be referable to imperfect mineral supply, to predominate. That this is the case few will deny, if the list be allowed to include all the different forms of struma, consumption, cancer, and their allied diseases. Latterly, professional opinion has begun to look upon these diseases as much more likely to have some common or allied origin than formerly. Not many years ago they were looked upon as having some specific and perfectly independent cause; but lately these views have been combated, and new light has been thrown upon their points of analogy by more than one observer. Dr. Tibbits and Dr. Simon have both independently shown that there are strong grounds for concluding these diseases to be diseases of innutrition, and Dr. Tibbits has shown the probable relationship of cancer, scrofula, syphilis, tubercle, and other allied morbid conditions." *

The investigations of Dr. Anderson himself practically decide these points. They may be said to amount to conclusive demonstration that the specific defect of innutrition is the absence of the tissue or tribasic phosphate in the capillaries or arterioles, determining defect of structure in some one of the great soft organs. "Certain parts of food feed certain tissues; the albuminous matter forms flesh, the gelatinous matter forms membrane, cartilage, etc.; *the inorganic substances enter into bone and capillary nutrition*, and the hydrocarbons enter into fat formation." †

As to the efficiency, so overwhelmingly proved, of the Vinum Nutrio-Phosphaticum in brain and nerve disease, by reason of its tribasic phosphates and the certainty of assimilation ensured by its total composition, it is very desirable that there should be a thorough comprehension of the important part phosphorus plays in maintaining brain tissue; for all nerve-health depends upon perfect maintenance of that tissue, which in its turn is dependent upon the adequate presence and functions of tissue phosphate in *all* the soft organs. A great materialist philosopher of Germany has said broadly, that "without phosphorus there can be no thinking;" and analysis shows that minute as is the quantity of phosphoric acid in the

* Anderson, p. 136. † Anderson, p. 52.

healthy human brain, a lessening of it by only one-half is sufficient to determine hopeless defect of structure in that organ. "Some few months since," says Dr. Anderson,* "I examined the brain of a soldier who died of Addison's disease. Preceding death he had well-marked symptoms of cerebral congestion, the immediate cause of death. The *post-mortem* examination showed great congestion of all the blood-vessels within the cranium, and distinct brain-softening, which was more marked in the cerebellum than in the cerebrum. Both were examined for phosphoric acid. The cerebrum yielded .597 per cent., and the cerebellum only .482 per cent. Healthy human brain showed .728 per cent. The difference between these numbers indicates that the loss in the cerebellum of a quantity of phosphoric acid equal to about .246 per cent. reduced the healthy consistency of the brain to a softened pulpy mass, unfit to originate or transmit any of the impressions belonging to its function."

The only form in which phosphorus is found in any tissue of the animal kingdom is that of phosphoric acid. Let it be noted that in all the foods of man that is precisely the form in which phosphorus is found. Those foods contain the alkaline bases—sodium, magnesium, calcium, potassium—as oxides; but contain these independently of the phosphoric acid; with which they combine in the laboratory of the organism to form the multiplex tissue or tribasic phosphates that enter into the capillaries and inner membrane of arteries; an excess of free phosphoric acid is also found in brain and nerve structure. This simple statement, amply confirmed by rigid analysis, shows of what crucial importance it must be to present to organisms suffering from defect of tissue phosphate function, tribasic phosphates such as are contained in the Vinum Nutrio-Phosphaticum and in such shape as is there present, which ensures their being taken up into structure. For the precise fault in such organisms is that they cannot combine the phosphoric acid and bases of ordinary foods to produce the requisite tribasic phosphates required for the arteriole or capillary tissue. The phosphatic compounds contained in and presented by the Vinum

* Anderson, p. 45.

Nutrio Phosphaticum afford precisely the material, the mechanical stimulus, and the chemical means whereby the defect may be remedied; all these various elements of the combination being so related, qualitatively and quantitatively, as to bear designedly upon the result aimed at. And again let it be said, with all earnestness and emphasis, that the theoretic expectation raised by the Vinum Nutrio-Phosphaticum has never failed of fulfillment in three years of extensive professional use, covering nearly all the forms of disorder of function and disease of structure now so clearly traceable to defect of phosphatic nutrition.

The significance of this function of phosphatic nutrition in the human organism is strikingly shown by pathological facts connected with irregularities of its exercise. In lieu of the multiplex tribasic phosphates normally formed in the inner membranes of arteries, and leading up to the ulterior phosphates of the capillaries—phosphates combined of *all* the alkaline bases—there sometimes occurs a formation of bone or tricalcic phosphate in those inner membranes, "principally occurring just beneath the epithelial membrane, but at times invading the whole calibre of the artery. I have often observed plates of bony matter in the large arteries of animals slaughtered for food. Under the microscope these plates do not show the minute conformation or structure of bone, but chemical analysis shows that they are composed of bone phosphates; so that although the organization of bone is wanting, the chemical materials of bone are present. The deposit takes place in that portion of the artery in which, under normal conditions of tissue structure, tissue phosphate exists in largest proportion, in the inner coat. By an alteration or perversion of nutrition, bone phosphate is deposited in the place of tissue phosphate. This change in chemical composition may take place to a very large extent. In a case of sudden death, when the cause of death was obscure, I had to make a post-mortem examination. The whole arterial system was in a state of rigidity from calcification. The femoral was rigid enough to be held horizontally without bending. Death took place from rupture of the coronary artery around the heart; and extravasation of blood into the pericardium." *

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* Anderson, p. 106.

This remarkable case shows that phosphatic innutrition or irregularity is very probably the root of even a larger class of organic disease than that indicated in the foregoing observations, and suggests the necessity for the ingestion of tribasic or tissue phosphate as an auxiliary medicine in nearly the whole field of disease.

Indeed, the following simple considerations as to the chemistry of organic existence will show conclusively that it is in the mineral or phosphatic element of nutrition we have the decisive clue to that which is most specific in that constructive chemical work which originates and maintains life. They will show how entirely justifiable is the intuitive doctrine which has held that phosphorus is the key that unlocks the *physiologic* mystery of vital phenomena. What may properly be called the metophysiological mystery is one that can never be unlocked, because it is beyond the purview of observation and the potency of verbal expression. The doctrine which has assigned to phosphorus the master-power in vital chemistry, has been intuitive only, hereto; it has not been based on any adequate demonstration of the specific combination of phosphorus in the organism normal and abnormal. That demonstration is, however, now practically effected, and affords sufficient material for the argument which conclusively shows that *phosphatic* combination is, in the strictest sense, the *differentia*, the distinctive and special feature, of the chemico-vital action which maintains the existence of organisms.

The three elements of nutrition are: *first*, those which supply flesh; *secondly*, those which supply the means of combustion; *thirdly*, those which supply mineral or comparatively fixed tissues, including the now understood and critically important tissue phosphates. Protein or albumen—a compound consisting of definite proportions of carbon, nitrogen, hydrogen and oxygen, with a small quantity of sulphur—supplies flesh. And there is identity of chemical composition between the albumen of food and muscle. Gelatine, which enters into cartilage, membrane, bone, etc., is no more than protein that has been subjected to further and quantitatively ascertained oxidation in the system; by which oxidation it has been converted into quasi-mineral structure, and deprived of all power to act as a true food to the

organism which has produced it or any other. The heat maintaining foods are hydrocarbons. They are ingested as hydrocarbons into the system, and either totally eliminated, or else, according to the organic tendency, converted into fat, which is itself nothing but a hydrocarbon, and indicates nothing more than a certain reserve of fuel or power to meet emergencies.

In the cases, therefore, both of the flesh-forming and heat-maintaining food elements, the chemistry of the organism effects no new combination whatever. Albumen of food is albumen of muscle; hydrocarbons, if stored, are mere hydrocarbons. The oxidation of protein is a mere result of the respiratory act, and does not amount to new combination in the deeper and critical sense.

But very different is the case as regards the mineral nutrition, the *phosphatic* combinations. These are to all intents and purposes the product of the specific chemical laboratorium of the organism itself. There is no ingestion by way of food of any of the tribasic phosphates that enter into mineral tissue; no food contains tricalcic phosphate for bone structure; none contains any combination of phosphoric acid with any one of the four alkaline bases with which it forms the infinite combinations of tribasic or tissue phosphates for the purposes of the capillaries and the maintenance of the tissues of those great organs which constitute the very life itself—brain, lungs, liver, kidneys, spleen, skin—constitute it in the capital sense that organic lesion to any of these is, after a certain stage, incompatible with the prolongation of life.

Food, throughout its whole range, animal and vegetable, contains only, when ingested, the alkaline bases and the phosphoric acid as separate elements. As regards the vegetable food, that is certainly so; as regards the animal food, that is equally so, though it might at first sight appear otherwise. Because, although the capillaries and arterial membranes of the animals used for food, equally with those of the human subject, do *in life* contain the tribasic phosphates, these are not present in effective combination, either qualitatively or quantitatively for *food*, after the animal's tissues have been subjected, *first* to the shock of death, and next to the alterative operation of the cooking processes.

Indeed, the tribasic phosphates are so essentially the product, the sign, the differentiating principle of continuing and subsisting life, that they can only be said to appertain to the organism while it is in function. Their office of *maintaining* the vital tissues is accomplished by their own curious and individual power of infinitely combining the phosphoric acid with the four bases in such wise that one atom of the acid always goes with either three integers of three of those bases, or else a replacement of one or more of those three integral bases by an infinite series of thirds, ninths, twenty-sevenths, etc., of some other bases. That is to say, tissue phosphate is of such quality and function in the organism as to represent a dynamic flux of the strictly vital description in a *mineral* tissue; from which it follows, considering the specific work which this tissue has to accomplish in the body, that we have here the precise point where the inorganic and the organic elements strike hands to join in producing the phenomena which we call by the name of life. Tissue phosphate, therefore, is a property and product of continuing life.

These considerations constitute, it is earnestly submitted to thoughtful minds, a complete demonstration of the propositions advanced. They show that the *phosphatic nutrition* is organic in a higher sense than can be predicated of the albuminous or flesh nutrition on the one hand, or the hydrocarbonaceous or heat nutrition on the other; for they show that in the case of the phosphatic or mineral nutrition there are specific, new, and complex combinations of ingested factors of food; whereas, in the case of the albuminous or hydrocarbonaceous nutrition there is nothing but *comparatively* mechanical deposit in tissue, or elimination in more highly oxidized condition of precisely the same combinations as enter into the food itself before ingestion into the system.

The question of nutrition, food, life-maintenance, has been dealt with in later science too exclusively, it is submitted, from the point of view of the generation and expenditure of *force* in the mechanical sense. Allowing their fullest weight to the conclusions which investigation on these lines may reach, these can never touch the paramount problem of organic construction in its most radical sense. Between organic and mechanical action there is a gulf fixed which no numerically quantita-

tive expressions can ever bridge over. The doctrine of force, as applied to the study of the human organism, can deal only with the evolution of heat by oxidation. But this is not the real key to the organic action. It is rather the measure of the influence which in the long run resolves the material part of it into its elements, so far as that word is applicable. Or, to speak more accurately, oxidation is on the equivocal or boundary line which separates physical life from physical death, receding always farther from the line of life to the line of death, *resisted all the time by the most eminently constructive part of the organism*, but finally overcoming the resistance and having its own way with the inanimate tissues altogether.

The *constructive part of the organism* which thus resists, and for a while compels to the uses of life, oxygen, the great consuming agent of material things, is the phosphatic system. And it fulfills the office by virtue of the phosphorus. Viewed in this light, a new and deeper significance, physiological, chemical, and medical, attaches to the fact that phosphorus occurs in the organic world only in its highest condition of oxidation, as *phosphoric acid.* The principle which is to counteract oxygen the destroyer, and compel it to an episodic conformity with the uses of life, comes into the organized system in such guise that itself cannot be attacked by and combined with oxygen.

The phosphatic system, then, is to be viewed as a separate whole, as of coherent and common dynamic power, as the high organizing chemistry, in the organism. This view is entirely conformable to the facts of observation, and furnishes a theory on which observation and experiment may hereafter proceed with the fullest expectation of greater results in unfolding and dealing with the mysteries of physiologic existence than have yet been achieved. This separate and paramount system includes the framework of bone and the arterial system ; of which the arterioles or capillaries are but the ultimate outcome. From this point of view the observed analogy between bone and arterial structure becomes invested with peculiar significance. The entrance of gelatine into arterial structure, the liability of that structure to calcification, show, from the analogical and the pathological side respectively, the unity, in diverse manifestation, of the specific phosphoric influence which

binds together bones and arteries and arterioles in a community of function in the maintenance and reparation of the organism, during its allotted period of successful resistance to the assailant oxygen. Yet more; the bone system, seen from this standpoint, cannot be regarded a mere passive scaffolding for the building of the body at first, and, thereafter, as a mere passive frame for upholding it. Rather will it become necessary to regard the bones as arteries of one species, and the arteries usually so called, as arteries of another species.

The work of building up tissue is regarded too exclusively, it will be held, hereafter, as the work of the arterioles or capillaries. *Immediately* it is their work, no doubt. But *mediately* it is the work of the generic arterial system, including the arterial bones. In all cases of lesion to bone structure, mechanical or other, the reparation takes place, it is quite certain, by the joint constructive activities of the medullary contents of bone channel and of the specific arterial blood in closest proximity. The arterioles nearest to the need, acting with the bone circulation, turn their energies to the formation of the tricalcic phosphate necessary for bone reparation, suspending, measurably, their more subtle power of forming the infinitely differentiated tribasic phosphates of all the four bases necessary to the various soft tissues. Such is the unquestionable correlation of action of the bone and arterial—or *general arterial*—system in abnormal or pathological conditions.

In normal conditions we may—or rather, indeed, we must—conceive of that correlated action as bearing a strong anology to that of soil and plant in the botanical world. Bone tissue is of slow waste and reproduction, but it is subject to waste. The displacement between the phosphatic and gelatine constituents always going on in that structure is in correlation with displacement between the phosphatic and gelatine constituents always going on in arterial structure. We must regard, then, the bone mass, with its great quantities of tricalcic phosphate, and therein of accumulated phosphoric acid as the soil, superphosphated of lime, out of which grows the ramified superstructure of the soft arterial phosphatic system. And the differentiation of the four tribasic phosphates in this ramified arterial superstructure, under the operation of nerve (or ultimate life)

power, together with the organs which that superstructure maintains, must be regarded as the analogue of stem, branches, leaves, flowers, and fruits, in the botanical world.*

Recurring, once more, to the principle of the qualitative composition of the Vinum Nutro-Phosphaticum, it may be affirmed that it constitutes the only theoretically possible and available method by which the action of the phosphate system of the body can be medically dealt with. It can scarcely admit of doubt or question that the chemistry of phosphatic combination in the organism is of the following kind: The alkaline bases and the phosphoric acid are ingested separately in the foods. The first step taken within the organic laboratory can hardly be other than to form a simple, separate tribasic phosphate with each of the four bases. The simple tricalcic phosphate is applied to bone structure; and the fact that such a one simple phosphate is required for that structure, taken in combination with the considerations just advanced as to the correlations of bone and artery, is quite sufficient to justify the conclusion that in the first instance all the four tribasic phosphates are formed, *simpliciter;* and as such they are all formed with a first view to the bone structure, although the tricalcic variety is alone applied to that. After that primary office to the most permanent part of the structure is discharged, there begins that differentiation and interchange of the bases and fractions of bases of the four tribasic phosphates indicated by the needs of the separate soft and vascular tissues. The infirmity of language and the obscurity of the subject oblige us, in this connection, to speak of these intra-organic operations as successive in time, though they are rather simultaneous than successive. For practical purposes, however, we are tied and bound by this necessity. We are obliged in therapeutics to deal with bodily phenomena as successive. It

* In this writing the physiologic ground is intended to be strictly adhered to. It is hardly trenching on the metaphysiologic ground to suggest to thoughtful minds here that if light—or motion between the molecules of the ether of space—be, in a sense, the source of all force, it is by strong presumption peculiarly or specifically the force which generates organic life. If phosphorus, then the "light-bearer," really be the channel by which force translates itself into life, it is a curious accident by which this element has become endowed with this appellation.

follows from this reasoning that the only conceivable method by which the first necessary impulse, encouragement and fortification can be given to the phosphatic system of the body, is by ingestion with suitable accompaniments of all the four tribasic phosphates. And this is precisely what is done by the VINUM NUTRIO-PHOSPHATICUM.

It is also largely concerned in the metamorphosis of matter, for it is certain that when taken with meals the Vinum Nutrio-Phosphaticum gives a soluble form to the plastic constituents of food and of the animal tissues.

Letheby has shown that the saline or mineral constituents of food are largely concerned in the phenomena of digestion, absorption, sanguinification, assimilation, disintegration and secretion. He says: "In truth they are the chief if not the only media for the transference of organic matter from place to place in the animal body, being on one hand the purveyors of nutrient materials into the system, and on the other the carriers of effete substances out of it; besides which it is very probable that they are the agents whereby liquid colloidal forms of nutriment are changed into solid or pectous, as in the formation of solid tissues from the blood, and conversely the solid into liquid.

"In the case of digestion and absorption, the plastic elements of our food as albumen, fibrin, gelatin, &c., are not of themselves capable of dialysis, by passing through the walls of the alimentary canal; and, therefore, absorption must be assisted by some physical agent, this agent is the highly diffusive acids and salts, which are secreted so freely into the stomach during digestion; and it is very probable that they not only effect a solution of the protenaceous matters of food, but by converting it into peptones as Lehmann expresses it, they also change the molecular form of the material and make it pass from an unabsorbable culloid into a highly diffusive crystalloid." But, in dyspepsia and many other forms of disease, the stomach fails to secrete the acids and salts necessary for normal digestion, hence the value of the Vinum Nutrio-Phosphaticum which supplies these deficiencies. As to the special functions of the four tribasic phosphates contained in the Vinum Nutrio-Phosphaticum, it is a remarkable fact that the alkaline or basic phosphate of soda is invariably found in the blood, while acid phosphate of potash is the chief constituent of the juice of flesh.

The alkaline phosphate of soda in the blood prevents the transudation of nutrient matter, the acid phosphate of potash in the muscular fluid promotes it; and thus it is concerned in nutrition and in the solution of worn out tissue.

The phosphates of magnesia and lime, especially the latter, are the agents for the consolidation of tissue, "all of the phosphates contained in the tissues belong to the tribasic order, nervous tissues containing in addition phosphoric acid as a hydrate, or in combination with organic matter."

It is necessary now, for the purpose of guarding readers against misapprehension, to state that the Vinum Nutrio-Phosphaticum was first introduced into practice in the year 1876, as the result of many years of study of the relations of phosphorus to the system, and much previous trial and experience and combination of phosphorus with bases for remedial purposes. This statement is necessary because so much use has been made in this writing of the very valuable book of Dr. Anderson. Dr. Anderson's work is invaluable as a justification of the composition of the VINUM NUTRIO-PHOSPHATICUM; and it is precisely in that light that it must be viewed. Dr. Anderson's book bears date, May, 1878, two years after the VINUM was first used. The investigations therein detailed are of incalculable value, as proving the diffusion throughout the arterial and capillary system of the tribasic phosphates, to which the distinguished writer gives the name of tissue phosphate. But the simple statements here made, as to the respective dates of the introduction of the VINUM into practice and the appearance of Dr. Anderson's book, is enough to show that the VINUM NUTRIO-PHOSPHATICUM is the result of prior study and a strictly prior product.

To sum up the matter, then, it is with the greatest respect, but the greatest decision, that the VINUM NUTRIO-PHOSPHATICUM is urged upon the attention of the medical profession as INDISPENSABLE.

FIRST. As a means of prophylaxis and support to the female system, generally at all the critical periods, connected with the reproductive function; but chiefly and above all, during gestation and lactation, and for a suitable time after lactation has ceased; especial regard being paid also to the beginning and end of the period during which the reproductive function is capable

of being exercised; at the later of which seasons the prophylactic effect upon the female system, against phthisis and cancer of the *Vinum Nutrio-Phosphaticum* will be at its *maximum.*

SECONDLY. As a means of promoting healthy growth in the youthful body wherever there is symptomatic indication of a failure in the quantitative or qualitative action of the *phosphatic functions within the system.*

THIRDLY. In all cases of brain disorders, and neurasthenia.

FOURTHLY. As a means of tonic support in the stage of reconstruction and convalescence at the subsidence of acute diseases of every kind; and also in cases of sudden failure of power, as in syncope.

FIFTHLY. As an invariable means of prolonging efficiency in declining years.

SIXTHLY. In all cases of phthisis, pulmonary and other; cancer, rickett, scrofula, leprosy, syphilis.

SEVENTHLY. In all cases of serious lesion due to accident, lesion of bone and other tissues.

EIGHTHLY. In all cases of educational strain, the failure of the normal functions of the brain among nearly all the civilized nations of the world is alarmingly on the increase. Professor Treichler, a German physician, "has been analyzing the causes of habitual headache, especially in children. The result of his studies he embodied in a paper, which was read by him in the section of Psychiatry and Neurology at the last meeting of the German Association of Natural Historians and Physicians, and which has attracted much comment in London, where it was recently published. According to his experience, habitual headache is much increasing among boys and girls. He comments on the difficulty of procuring exact statistics on the subject, but says that the result of various indefinitely-described investigations in the schools of several cities of France and Germany goes to prove that one third of the pupils suffer from this complaint. One cause he believes to be a too-ready fatigue of the brain, which is itself caused by *defective nutrition of its cells.*

Another cause is a passive dilatation of the blood-vessels of the brain, which bears a distant resemblance and affinity to the condition of the same vessels in the earliest stages of progressive paralysis. The very fortunate distinction between the two cases

is that in the more frequent disease—that is to say, in habitual headache—the palsied condition of the brain vessels is transitory, while in progressive paralysis it is usually permanent and irreparable. But it is to the cause of the disease rather than to the pathology of the brain that we would direct attention here. Dr. TREICHLER lends his support to the theory now generally accepted, that impressions on the memory, and intellectual acts in general, are the immediate results of physical changes in brain-tissue, or of the reactions within definite cells of certain forms of matter and force, though it still remains a riddle—as it probably must forever remain—how such molecular motion is transformed into what we call thought or operations of the "mind." Hence, the capacity for such acts is strictly correlated to the maintenance of cell-growth, and to the conversion of force from other modes of manifestation.

That process of growth and repair, Dr. TREICHLER declares, is seriously interfered with by the amount of mental work required of children at school. Such requirements not only produce brain-disease and headache, as already pointed out, but, he says, they defeat their own objects in two ways. In the first place, only what is grasped by the cells when in full strength is a permanent acquisition, as is illustrated and evidenced by the familiar fact that old men recall their youth, but forget more recent events. And in the second place, the cells can only understandingly take in new and difficult ideas, or assimilate them, to borrow a comparison from the processes of digestion, when they are vigorous as well as young, the exhaustion of age and of over-application being equally fatal to their capacity in this respect. In other words, an over-worked pupil finds it hard to understand his tasks, and impossible to remember them."*

There are multitudes of such sufferers, male and female, and not alone these, for they are to be found everywhere, but those who abound in the professional and literary classes, sufferers from nervous debility or brain mischief more or less advanced.

The mortality from over brain work is well known to be greatly on the increase everywhere, but the young may be re-

* The above is a literal transcript from an article recently published in the editorial columns of the *New York Times*.

tored to more than their pristine vigor by the systematic use of the Vinum Nutrio-Phosphaticum, while those of early manhood middle age, and even in some cases of more advanced life, may also be restored to vigor, by rest, pure air and the remedy here urged upon the attention of physicians. *The fact that the renewal of life is possible, is of grave importance, so much so, that it might be pressed in language stronger and warmer than that of scientific exposition.*

DIRECTIONS FOR THE USE OF THE VINUM NUTRIO-PHOSPHATICUM.

The dose for adults is from one to two tablespoonfuls with meals, or with some kind of proper food, as meat-juice, broth or solid food.

Proportional doses for children and infants.

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